

RGP-0122

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Sethumadhavan et al.)
Serial No.: 10/663,373) Group Art Unit: 1711
Filed: September 16, 2003) Examiner: C. Lam
For: ELECTRICALLY CONDUCTIVE)
POLYMERIC FOAMS AND)
ELASTOMERS AND METHODS OF)
MANUFACTURE THEREOF)

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DECLARATION PURSUANT TO 37 CFR 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Sankar K. Paul, Ph.D., a U.S. citizen residing at 32 Pent Road in Branford,
Connecticut, declares and states:

1. My educational background includes a Bachelor of Science in Chemistry, Mathematics & Physics, First Class, from the University of Dhaka, Bangladesh (1972), a Master of Science in Applied Chemistry, First Class, from the University of Rajshahi, Bangladesh (1975) where I was ranked first in my class, a Ph.D. in Polymer Technology from the University of Calcutta, India (1985), and an MBA from University of New Haven, USA (2000).

2. I have been employed by Rogers Corporation since 2001, where I am currently a Principal Engineer in Corporate R&D working in the area of new technology and product development for circuit boards.

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3. I am one of the inventors of the above-identified Application.

4. I have reviewed the Office Action dated September 20, 2004.

5. We have unexpectedly found improved adhesion of a metal foil to a dielectric material for a circuit substrate, with the addition of a fluoropolymer filler to the dielectric material.

6. I have supervised the preparation and testing of two samples, made both with and without a fluoropolymer filler.

7. The first sample was prepared according to the following procedure. Silica filler BSI LT-30, Brookes Services, Inc.) was treated with A-187 epoxy functional silane from OSi. The treated silica filler was then compounded with LCP polymer (Vectra C from Ticona) at a level of 40 weight percent (wt%) silica using a twin-screw extruder, to form the first sample.

8. To prepare the second sample, a mixture of 62.75 wt% fine particles size filler (CE 441 from CE Minerals) and 37.25 wt% polytetrafluoroethylene (PTFE, Fluon-G580 from Ashahi Glass) was mixed in a Vee Blender, then pressed through a two-roll calendar at a pressure of 2500 pounds per linear inch (pli) and at a temperature of 100°C. This silica and PTFE mixture was compounded at a level of 40 wt% silica with LCP polymer (Vectra C from Ticona) using a twin screw extruder to form the second sample. The net composition of the second sample was 25.1 wt% silica and 14.9 wt% PTFE with the balance comprising LCP polymer.

9. Both the first and second samples were individually molded into pancakes of approximately 15 to 20 mil thickness using a flat bed press at 630° F and 250 psi. A pair of pancakes of each sample was laminated using a piece of 1080 oven glass fabric in between the pancakes, and copper foil (NTTOR type from Circuit Foil Luxembourg) was laminated to the outsides of the pancakes.


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10. The laminates were tested for copper adhesion as reflected by peel strength, using a 90°-peel tester on 1/8-inch wide copper foil strips. Test samples were peel-tested both at room temperature and while immersed in 200°C hot oil. The peel strength results are given in units of pounds per linear inch (pli) in the Table below.

Sample	Room Temperature copper bond strength (pli)	200°C copper bond strength (pli)
Vectra C with 40 wt% silica	3.93	0.86
Vectra C with 25.1 wt% silica / 14.9 wt% PTFE particles	5.26	1.85

11. As shown in the above Table, the sample having only LCP and silica filler exhibited a peel strength of 3.93 pli at room temperature of, and 0.86 pli at 200°C. In contrast, the sample having a combination of LCP, silica and PTFE filler exhibited a substantially increased peel strength of 5.26 pli at room temperature, and of 1.85 pli at 200°C, a percent increase of 35% at room temperature and 115% at 200°C.

14. I declare that all statements made herein are true to the best of my knowledge and that all statements made on information and belief are believed to be true; and further that these statements and representations were made with the knowledge that willful false statements, so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the Application or any Patent issued therefrom.

Date: 02/08/05

Sankar K. Paul, Ph.D.